LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-55 (Canceled)

Claim 56 (Currently Amended)

An apparatus for mixing a first fluid with a second fluid, the apparatus comprising:

a fluid delivery system for transporting the first fluid to a mixing region;

a duct which defines a flow path for the second fluid through the mixing region; and

an elongated fluid contactor which forms a flow path for the first fluid from which the first fluid is delivered into the duct,

wherein the elongated fluid contactor includes:

an inlet coupled to receive the first fluid from the fluid delivery system; and

a plurality of outlet orifices providing fluid communication between the flow path in the elongated fluid contactor and the interior of the duct through which the first fluid is delivered into the second fluid;

wherein along a first curvilinear ~~transverse~~ direction along, or circumferentially about the elongated ~~a~~ contactor surface, at least one of:

the distribution of orifice spatial locations is ~~non-uniform~~systematically varied;

the distribution of orifice size is systematically varied~~non-uniform~~; and

the distribution of orifice orientation ~~is non-uniform~~, relative to ~~one of the axial, radial, and~~ the circumferential ~~directions~~ direction of the elongated fluid contactor, is systematically varied ~~excluding a first or second orthogonal directions transverse to the mean streamwise flow;~~

~~the non-uniform distribution comprising at least a non-uniform quadrality having at least four differing regions along the curvilinear path along the contractor surface; and~~

~~wherein the apparatus orifice distributions are configured to deliver at least one of:~~

~~a prescribed transverse distribution of the first fluid in the second fluid;~~

~~a prescribed streamwise distribution of the first fluid in the second fluid;~~

~~a prescribed transverse distribution of a ratio of the first fluid to the second fluid, by mass or by volume; and~~

~~a prescribed streamwise distribution of a ratio of the first fluid to the second fluid, by mass or by volume,~~

~~the fluid distribution being taken in at least four differing regions along a curvilinear path transverse to the second flow, or streamwise along the second flow direction, respectively~~.

Claim 57 (Previously Presented)

The apparatus of claim 56, wherein said fluid delivery system comprises a manifold delivering fluid to multiple elongated fluid contactors.

Claim 58 (Previously Presented)

The apparatus of claim 57, wherein said elongated fluid contactor comprises a plurality of curvilinear segments extending transversely to the second fluid flow path in the duct.

Claim 59 (Previously Presented)

The apparatus of claim 58, wherein one of said elongated fluid contactor segments is positioned downstream of another elongated fluid contactor segment relative to the flow path of the second fluid.

Claim 60 (Withdrawn)

The apparatus of claim 56, wherein the first fluid comprises a liquid, the second fluid comprises a gas, and wherein the orifices and the first fluid delivery system are configured so that a prescribed portion of the first fluid evaporates in the second fluid within the duct.

Claim 61 (Withdrawn)

The apparatus of claim 60, wherein the prescribed portion of the first fluid evaporates within a prescribed distance from the fluid contactor orifices.

Claim 62 (Withdrawn)

The apparatus of claim 60, wherein the first fluid delivery system is configured to control one of the delievery pressure and/or the flow rate of the first fluid in the fluid contactor.

Claim 63 (Withdrawn)

The apparatus of claim 56, wherein the fluid delivery system further comprises a vibration generator configured to vibrate the fluid contactor.

Claim 64 (Withdrawn)

The apparatus of claim 63, wherein the vibration generator vibrates the fluid contactor in a direction generally perpendicular to the axes of most of the orifices.

Claim 65 (Currently Amended)

The apparatus of claim 56, wherein the fluid delivery system further comprises a high voltage power supply, having a first electrode connected to the elongated fluid ~~contractor~~contactor comprising orifices, and having a second electrode connected to one of the duct, an electrode within the duct, and a second-elongated ~~contractor~~contactor comprising orifices, configured to establish an electric field which modifies the flow of the first fluid delivered by said orifices.

Claim 66 (Previously Presented)

The apparatus of claim 65, wherein the mean magnitude of the applied high voltage is within a desired range to reduce the cross sectional area of the first fluid after it passes through said orifices without causing an arc.

Claim 67 (Previously Presented)

The apparatus of claim 65, wherein the power supply is configured to provide a fluctuating voltage within a prescribed range to oscillate the delivered first fluid flow.

Claim 68 (Previously Presented)

The apparatus of claim 98, wherein the areal density of said plurality of orifices is at least 100,000 per square meter of duct cross sectional area.

Claim 69 (Previously Presented)

The apparatus of claim 56, wherein said plurality of orifices have an average diameter of less than about 80 microns.

Claim 70 (Previously Presented)

The apparatus of claim 56, wherein a portion of said elongated fluid contactor comprises a tubular member configured to form a three dimensional curvilinear structure having a plurality of curvatures.

Claim 71 (Previously Presented)

The apparatus of claim 56, wherein said elongated fluid contactor comprises a flexible support for connecting said fluid delivery system to said plurality of orifices.

Claim 72 (Previously Presented)

The apparatus of claim 56, wherein said elongated fluid contactor comprises:

at least one curvilinear tubular member through which the first fluid is delivered, and which has an axis of elongation that extends in a direction approximately parallel to at least a portion of the flow path of the second fluid; and

at least one manifold that connects said tubular member to the fluid delivery system.

Claim 73 (Previously Presented)

The apparatus of claim 56, wherein said elongated fluid contactor comprises at least one curvilinear tube extending transversely to the second fluid flow path.

Claim 74 (Previously Presented)

The apparatus of claim 56, wherein said orifices are configured to deliver the first fluid into the flow path of the second fluid with a non-uniform distribution transverse to the second fluid flow path.

Claim 75 (Previously Presented)

The apparatus of claim 56, wherein some orifices have a longitudinal axis that is oblique to a local longitudinal axis of the elongated fluid contactor.

Claim 76 (Previously Presented)

The apparatus of claim 56, wherein said orifices are configured with a non-uniform spatial distribution of orientation to deliver the first fluid into the second fluid with a non-uniform flow distribution transverse to the second fluid flow path.

Claim 77 (Previously Presented)

The apparatus of claim 56, wherein said orifices are configured with a non-uniform spatial distribution of size to deliver the first fluid into the flow path of the second fluid with a non-uniform flow distribution transverse to the second fluid flow path.

Claim 78 (Previously Presented)

The apparatus of claim 98, wherein said orifices are configured with a non-uniform spatial distribution of areal density to deliver the first fluid into the flow path of the second fluid with a non-uniform distribution transverse to the second fluid flow path.

Claim 79 (Previously Presented)

The apparatus of claim 56, wherein said elongated fluid contactor and said one or more non-uniform orifice distributions are configured to deliver the first fluid into the second fluid, to provide a prescribed non-uniform transverse distribution of the first fluid in the second fluid, the non-uniform distribution being taken at a plurality of locations along a curvilinear path transverse to the second flow.

Claim 80 (Previously Presented)

The apparatus of claim 56, wherein said elongated fluid contactor and said one or more non-uniform orifice distributions are configured to deliver the first fluid into the second fluid, to provide a prescribed non-uniform transverse distribution of the ratio of the first fluid to the

second fluid, by mass or by volume; the non-uniform distribution being taken at a plurality of locations along a curvilinear path transverse to the second flow.

Claim 81 (Previously Presented)

The apparatus of claim 56, wherein the elongated fluid contactor has a streamlined cross-section with respect to the flow path of the second fluid.

Claim 82 (Previously Presented)

The apparatus of claim 56, wherein the elongated fluid contactor comprises a thin walled sheet attached to a structural member and wherein the orifices are formed in the thin walled sheet.

Claim 83 (Previously Presented)

The apparatus of claim 56, wherein the elongated fluid contactor comprises a wall with thinner portions with orifices configured in said thinner portions.

Claim 84 (Withdrawn)

A method for mixing a first fluid with a second fluid, the method comprising:

providing a fluid delivery system for transporting the first fluid to a mixing region;

providing a duct which forms a flow path for the second fluid through the mixing region;

providing a fluid contactor which forms a flow path for the first fluid;

wherein the fluid contactor includes:

an inlet for receiving the first fluid from the fluid delivery system; and

a plurality of orifices providing fluid communication between the flow path in the fluid contactor and the second fluid within the duct;

controlling the delivery pressure and/or the flow rate of the first fluid in the fluid contactor;

configuring the fluid contactor and one or more of the spatial distributions of areal density, orientation, and size the outlet orifices in accordance with selected parameters characterizing the first and/or second fluid to achieve a desired distribution of the first fluid in the second fluid; and

delivering the first fluid into the second fluid flow path through the outlet orifices.

Claim 85 (Withdrawn)

The method of claim 84, wherein the mass flow rate or the volume flow rate of the first fluid as delivered into the second fluid is controlled such that the first fluid is non-uniformly distributed transversely to the flow path of the second fluid.

Claim 86 (Withdrawn)

The method of claim 84, wherein the pressure of the first fluid as delivered into the second fluid is controlled such that the first fluid is non-uniformly distributed transversely to the flow path of the second fluid.

Claim 87 (Withdrawn)

The method of claim 84, wherein the distribution of the mass flow rate or the volume flow rate of the first fluid as delivered into the second fluid is controlled such that the first fluid is uniformly distributed transversely to the flow path of the second fluid.

Claim 88 (Withdrawn)

The method of claim 84, wherein the pressure of the first fluid as delivered into the second fluid is controlled such that the first fluid is uniformly distributed transversely to the flow path of the second fluid.

Claim 89 (Withdrawn)

The method of claim 84, wherein the fluid contactor is configured by positioning an orifice to achieve a desired distribution of the first fluid in the second fluid along a transverse direction to the flow path of the second fluid.

Claim 90 (Withdrawn)

The method of claim 84, wherein the first fluid comprises a liquid and wherein at least a portion of the first fluid is evaporated after delivery into the second fluid.

Claim 91 (Withdrawn)

The method of claim 90, wherein the delivery of the first fluid is controlled along a transverse direction to the flow path of the second fluid to achieve a desired distribution of evaporated first fluid.

Claim 92 (Withdrawn)

The method of claim 84, wherein the step of controlling the delivery pressure and/or the flow rate of the first fluid in the fluid contactor comprises:

determining the mass or volume flow of the second fluid; and

adjusting the flow of the first fluid to achieve a desired ratio of the mass or volume flow of the first fluid to the mass or volume flow respectively of the total fluid flow in the duct.

Claim 93 (Withdrawn)

The method of claim 92, wherein the ratio of the mass or volume flow of the first fluid to the mass or volume flow respectively of the total fluid flow, is controlled to vary according to a position within the duct.

Claim 94 (Withdrawn)

The method of claim 84, wherein the step of controlling the delivery pressure and/or the flow rate of the first fluid in the fluid contactor comprises:

monitoring a fluid temperature distribution at a location in the duct; and

adjusting the delivery of the first fluid into the second fluid to achieve a desired temperature distribution in the duct.

Claim 95 (Withdrawn)

The method of claim 94, wherein a portion of the first fluid is evaporated in the duct to achieve the desired temperature distribution.

Claim 96 (Previously Presented)

The apparatus of claim 56 wherein the elongated fluid contactor, and one or more non-uniform distributions of the spatial locations, size, and orientation, of the orifices are configured,

to deliver a prescribed non-uniform streamwise distribution of the first fluid in the second fluid; the non-uniform distribution being taken at a plurality of locations along a curvilinear path streamwise along the second flow direction respectively.

Claim 97 (Previously Presented)

The apparatus of claim 56 wherein the elongated fluid contactor, and one or more non-uniform distributions of the spatial locations, size, and orientation, of the orifices are configured, to deliver a prescribed non-uniform streamwise distribution of a ratio of the first fluid to the second fluid, by mass or by volume, the non-uniform distribution being taken at a plurality of locations along a curvilinear path streamwise along the second flow direction respectively.

Claim 98 (Previously Presented)

The apparatus of claim 56, further comprising at least one of a elongated fluid contactor having a plurality of portions comprising outlet orifices, and a plurality of elongated fluid contactors comprising outlet orifices, wherein at least one of the fluid contactor and the outlet orifices are configured such that along a second curvilinear transverse direction, the distribution of orifice areal density between the outer portions or outer contactors is non-uniform.

Claim 99 (Previously Presented)

The apparatus of claim 56, wherein the apparatus orifice distributions are configured to deliver at least one of:

a prescribed non-uniform transverse distribution of the first fluid in the second fluid; and

a prescribed non-uniform streamwise distribution of the first fluid in the second fluid.

Claim 100 (Previously Presented)

The apparatus of claim 56, wherein the apparatus orifice distributions are configured to deliver at least one of:

a prescribed non-uniform transverse distribution of a ratio of the first fluid to the second fluid, by mass or by volume; and

a prescribed non-uniform streamwise distribution of a ratio of the first fluid to the second fluid, by mass or by volume.

Claim 101 (New)

The apparatus of claim 56, wherein the distribution of orifice angle of attack to the second fluid flow path is non-uniform, along the elongated fluid contactor axis or circumferentially around the elongated fluid contactor, excluding a first or second orthogonal directions transverse to the second fluid flow path.

Claim 102 (New)

The apparatus of claim 56, wherein the systematically varied distribution of orifice spatial locations, orifice size or orifice orientation is a progressively varied distribution.